

WHAT IS CLAIMED IS:

1. An optical scan module constituted as a single integral solid body with a function for deflecting a light beam from a light emission source by a deflection unit to repeat
5 scanning,

wherein the optical scan module has an arrangement in which the light emission source, the deflection unit, and terminals connected to a drive circuit for the light emission source or a drive circuit for the deflection unit
10 are integrally fixed to a holder, the holder is formed with an abutment portion to be brought into abutment with another member when mounted to the other member, and the terminals constitute a mounting unit for mounting the holder to the other member.

15

2. The optical scan module according to claim 1, wherein the optical scan module further comprises a frame having a radiation plate projecting outside an outline of the holder, and the light emission source is joined to the radiation
20 plate.

3. The optical scan module according to claim 1, wherein the holder is applied with at least one of the light emission

4. The optical scan module according to claim 1, wherein a focus unit and the holder are integrally provided so that the scanning is allowed with a width corresponding to $1/k$ (k is a positive integer) of a paper sheet width of a standard
5 size.

5. An optical scan module comprising a light emission source and a deflection unit which deflects a light beam from the light emission source to repeat scanning,
10 wherein the optical scan module has a holder provided with electrodes for electrical wiring to the light emission source and the deflection unit and configured for holding a movable portion of the deflection unit, and a sealing substrate to be provided together with the holder in a piled
15 relationship, and the light emission source and the movable portion of the deflection unit are enveloped to be tight-closed between the holder and the sealing substrate.

6. The optical scan module according to claim 5, wherein
20 a light source portion substrate applied at least with the light emission source and a monitor unit which detects a light quantity of light beam from the light emission source is provided in a piled relationship between the holder and

7. The optical scan module according to claim 5, wherein a frame substrate integrally formed with a fifth reflection unit which conducts a light beam from the light emission source to the deflection unit is provided in a piled relationship between the electrode substrate and the sealing substrate.

8. The optical scan module according to claim 5, further comprising a second reflection unit which injects a light beam deflection-scanned by the deflection unit, in a direction non-parallel to a lamination surface.

9. The optical scan module according to claim 8, wherein a frame substrate for enveloping the movable portion of the deflection unit is provided in a piled relationship between the holder or the electrode substrate and the sealing substrate, and the second reflection unit is integrally formed on the frame substrate.

10. The optical scan module according to claim 9, wherein in place of the frame substrate a frame the sealing substrate envelopes the movable portion of the deflection unit, and the second reflection unit is integrally provided with a

11. The optical scan module according to claim 8, wherein a scan lens for focusing on a scanned surface the light beam deflection-scanned by the deflection unit is provided in part on the holder or the sealing substrate.

5

12. The optical scan module according to claim 11, wherein the scan lens is integrally provided in part with a focus unit disposed between the light emission source and the deflection unit.

10

13. The optical scan module according to claim 5, wherein the optical scan module further comprises a frame having a radiation plate projecting outside an outline of the holder, and the light emission source is joined to the radiation
15 plate.

14. The optical scan module according to claim 5, wherein the holder is applied with at least one of the light emission source and the drive circuit for the light emission source.

20

15. The optical scan module according to claim 5, wherein a focus unit and the holder are integrally provided so that the scanning is allowed with a width corresponding to $1/k$

16. An optical scan module comprising a light emission source and a deflection unit which deflects a light beam from the light emission source to repeat scanning,

wherein, on an electrode substrate for provision of electrodes connected to the light emission source and the deflection unit and a bearing of the deflection unit, a light source portion substrate applied with the light emission source and a monitor unit which detects a light quantity of light beam from the light emission source and a deflection portion substrate for holding a movable portion of the deflection unit are piled and sealed with a sealing substrate, whereby the light emission source and the movable portion of the deflection unit are enveloped and tight-closed.

17. The optical scan module according to claim 16, wherein a frame substrate integrally formed with a fifth reflection unit which conducts a light beam from the light emission source to the deflection unit is provided in a piled relationship between the electrode substrate and the sealing substrate.

18. The optical scan module according to claim 16, further comprising a second reflection unit which injects a light

19. The optical scan module according to claim 18, wherein a frame substrate for enveloping the movable portion of the deflection unit is provided in a piled relationship between the holder or the electrode substrate and the sealing substrate, and the second reflection unit is integrally formed on the frame substrate.

20. The optical scan module according to claim 19, wherein in place of the frame substrate a frame the sealing substrate envelopes the movable portion of the deflection unit, and the second reflection unit is integrally provided with a focus unit disposed between the light emission source and the deflection unit.

21. The optical scan module according to claim 18, wherein a scan lens for focusing on a scanned surface the light beam deflection-scanned by the deflection unit is provided in part on the holder or the sealing substrate.

22. The optical scan module according to claim 21, wherein the scan lens is integrally provided in part with a focus unit disposed between the light emission source and the deflection unit.

23. The optical scan module according to claim 16, wherein the optical scan module further comprises a frame having a radiation plate projecting outside an outline of the holder, and the light emission source is joined to the radiation
5 plate.

24. The optical scan module according to claim 16, wherein the holder is applied with at least one of the light emission source and the drive circuit for the light emission source.

10

25. The optical scan module according to claim 16, wherein a focus unit and the holder are integrally provided so that the scanning is allowed with a width corresponding to $1/k$ (k is a positive integer) of a paper sheet width of a standard
15 size.

26. An optical scanner comprising an optical scan module fixed on another member,

the optical scan module constituted as a single
20 integral solid body with a function for deflecting a light beam from a light emission source by a deflection unit to repeat scanning,

wherein the optical scan module has an arrangement

emission source or a drive circuit for the deflection unit are integrally fixed to a holder, the holder is formed with an abutment portion to be brought into abutment with another member when mounted to the other member, and the terminals
5 constitute a mounting unit for mounting the holder to the other member,

wherein k units of optical scan modules are arranged to be fixed on a circuit substrate which is constituted as the other member and identical to that formed with the light
10 emission source and the deflection unit.

27. The optical scanner according to claim 26, wherein a plurality of optical scan modules are provided, and a respective optical scan module is positioned to be fixed
15 on the identical circuit substrate, with the abutment portion abutting thereon, so that their respective relative inclinations are adjusted to have an aligned scan direction.

28. The optical scanner according to claim 27, wherein
20 the optical scan modules are positioned to be fixed, with the abutment portions brought into abutment on the identical circuit substrate, so that their respective relative positions are adjusted in a subsidiary scan direction

29. The optical scanner according to claim 26, further comprising one or two or more photo detection unit which detects a scan start end and a scan finish end defined by light projected from the respective optical scan module.

5

30. The optical scanner according to claim 29, further comprising a measurement unit which measures a variation of occurrence timing between a photo detection signal of light at a scan finish end by light of the respective optical scan module and a detection signal at a scan start end by light of a neighboring optical scan module on the side of the scan finish end.

31. The optical scanner according to claim 26, wherein focus elements adapted for light projected from the optical scan modules to be focused on a scanned surface at least in a subsidiary scan direction perpendicular to the scan direction are continuously and integrally provided in an array direction of the optical scan modules.

20

32. The optical scanner according to claim 31, wherein a scan width restriction unit which restricts respective scan widths by light of the optical scan modules is disposed

33. The optical scanner according to claim 32, wherein the scan width restriction unit comprises a reflective member, and a reflected light beam is detected by the photo detection unit.

5

34. The optical scanner according to claim 26, further comprising a plurality of buffer unit which temporally stores image data in correspondence to the optical scan modules, a switch unit which divides a single line of image data for
10 allotment to the respective optical scan module to effect distribution to a respective buffer unit, and a count unit which counts a number of allotted image data.

35. The optical scanner according to claim 34, wherein,
15 for the respective optical scan module, a detection enable interval is provided every line by using as a trigger a synchronism detection signal of a neighboring optical scan module on a scan start side, and a reading control of image data from the buffer unit is executed simply by use of a
20 detection signal detected in the detection enable interval.

36. The optical scanner according to claim 34, wherein the respective optical scan module has a phase control unit

signal of the optical scan module is detected at least with a delay from the synchronism detection signal of a neighboring optical scan module on a scan start side.

5 37. The optical scanner according to claim 34, wherein the respective optical scan module has a detection position control unit which controls a principal scan position of an incident beam to the photo detection unit so that the synchronism detection signal of the optical scan module is
10 detected at least with a delay from the synchronism detection signal of a neighboring optical scan module on a scan start side.

38. The optical scanner according to claim 36, wherein
15 the plurality of optical scan modules and the photo detection unit detecting the synchronism detection signal are integrally held on the identical circuit substrate.

39. An optical scanner comprising an optical scan module
20 fixed on another member,

the optical scan module including a light emission source and a deflection unit which deflects a light beam from the light emission source to repeat scanning,

with a delay from the synchronism detection signal of the neighboring optical scan module on a scan start side.

source and the deflection unit and configured for holding a movable portion of the deflection unit, and a sealing substrate to be provided together with the holder in a piled relationship, and the light emission source and the movable
5 portion of the deflection unit are enveloped to be tight-closed between the holder and the sealing substrate,

wherein k units of optical scan modules are arranged to be fixed on a circuit substrate which is constituted as the other member and identical to that formed with the light
10 emission source and the deflection unit.

40. The optical scanner according to claim 39, wherein a plurality of optical scan modules are provided, and a respective optical scan module is positioned to be fixed
15 on the identical circuit substrate, with the abutment portion abutting thereon, so that their respective relative inclinations are adjusted to have an aligned scan direction.

41. The optical scanner according to claim 40, wherein
20 the optical scan modules are positioned to be fixed, with the abutment portions brought into abutment on the identical circuit substrate, so that their respective relative positions are adjusted in a subsidiary scan direction

42. The optical scanner according to claim 39, further comprising one or two or more photo detection unit which detects a scan start end and a scan finish end defined by light projected from the respective optical scan module.

5

43. The optical scanner according to claim 42, further comprising a measurement unit which measures a variation of occurrence timing between a photo detection signal of light at a scan finish end by light of the respective optical scan module and a detection signal at a scan start end by light of a neighboring optical scan module on the side of the scan finish end.

44. The optical scanner according to claim 39, wherein focus elements adapted for light projected from the optical scan modules to be focused on a scanned surface at least in a subsidiary scan direction perpendicular to the scan direction are continuously and integrally provided in an array direction of the optical scan modules.

20

45. The optical scanner according to claim 44, wherein a scan width restriction unit which restricts respective scan widths by light of the optical scan modules is disposed

46. The optical scanner according to claim 45, wherein the scanwidth restriction unit comprises a reflective member, and a reflected light beam is detected by the photo detection unit.

5

47. The optical scanner according to claim 39, further comprising a plurality of buffer unit which temporally stores image data in correspondence to the optical scan modules, a switch unit which divides a single line of image data for
10 allotment to the respective optical scan module to effect distribution to a respective buffer unit, and a count unit which counts a number of allotted image data.

48. The optical scanner according to claim 47, wherein,
15 for the respective optical scan module, a detection enable interval is provided every line by using as a trigger a synchronism detection signal of a neighboring optical scan module on a scan start side, and a reading control of image data from the buffer unit is executed simply by use of a
20 detection signal detected in the detection enable interval.

49. The optical scanner according to claim 47, wherein the respective optical scan module has a phase control unit

signal of the optical scan module is detected at least with a delay from the synchronism detection signal of a neighboring optical scan module on a scan start side.

5 50. The optical scanner according to claim 47, wherein the respective optical scan module has a detection position control unit which controls a principal scan position of an incident beam to the photo detection unit so that the synchronism detection signal of the optical scan module is
10 detected at least with a delay from the synchronism detection signal of a neighboring optical scan module on a scan start side.

51. The optical scanner according to claim 49, wherein
15 the plurality of optical scan modules and the photo detection unit detecting the synchronism detection signal are integrally held on the identical circuit substrate.

52. An optical scanner comprising an optical scan module
20 fixed on another member,

the optical scan module including a light emission source and a deflection unit which deflects a light beam from the light emission source to repeat scanning,

deflection unit and a bearing of the deflection unit, a light source portion substrate applied with the light emission source and a monitor unit which detects a light quantity of light beam from the light emission source and a deflection
5 portion substrate for holding a movable portion of the deflection unit are piled and sealed with a sealing substrate, whereby the light emission source and the movable portion of the deflection unit are enveloped and tight-closed,

wherein k units of optical scan modules are arranged
10 to be fixed on a circuit substrate which is constituted as the other member and identical to that formed with the light emission source and the deflection unit.

53. The optical scanner according to claim 52, wherein
15 a plurality of optical scan modules are provided, and a respective optical scan module is positioned to be fixed on the identical circuit substrate, with the abutment portion abutting thereon, so that their respective relative inclinations are adjusted to have an aligned scan direction.

20

54. The optical scanner according to claim 53, wherein the optical scan modules are positioned to be fixed, with the abutment portions brought into abutment on the identical

perpendicular to the scan direction.

55. The optical scanner according to claim 52, further comprising one or two or more photo detection unit which
5 detects a scan start end and a scan finish end defined by light projected from the respective optical scan module.

56. The optical scanner according to claim 55, further comprising a measurement unit which measures a variation
10 of occurrence timing between a photo detection signal of light at a scan finish end by light of the respective optical scan module and a detection signal at a scan start end by light of a neighboring optical scan module on the side of the scan finish end.

15

57. The optical scanner according to claim 52, wherein focus elements adapted for light projected from the optical scan modules to be focused on a scanned surface at least in a subsidiary scan direction perpendicular to the scan
20 direction are continuously and integrally provided in an array direction of the optical scan modules.

58. The optical scanner according to claim 57, wherein

in a light path from the deflection unit to the focus elements.

59. The optical scanner according to claim 58, wherein the scan width restriction unit comprises a reflective member, and a reflected light beam is detected by the photo detection unit.

60. The optical scanner according to claim 52, further comprising a plurality of buffer unit which temporally stores image data in correspondence to the optical scan modules, a switch unit which divides a single line of image data for allotment to the respective optical scan module to effect distribution to a respective buffer unit, and a count unit which counts a number of allotted image data.

15

61. The optical scanner according to claim 60, wherein, for the respective optical scan module, a detection enable interval is provided every line by using as a trigger a synchronism detection signal of a neighboring optical scan module on a scan start side, and a reading control of image data from the buffer unit is executed simply by use of a detection signal detected in the detection enable interval.

62. The optical scanner according to claim 60, wherein the respective optical scan module has a phase control unit which controls a phase of a rotation speed reference signal to the deflection unit so that the synchronism detection
5 signal of the optical scan module is detected at least with a delay from the synchronism detection signal of a neighboring optical scan module on a scan start side.

63. The optical scanner according to claim 60, wherein
10 the respective optical scan module has a detection position control unit which controls a principal scan position of an incident beam to the photo detection unit so that the synchronism detection signal of the optical scan module is detected at least with a delay from the synchronism detection
15 signal of a neighboring optical scan module on a scan start side.

64. The optical scanner according to claim 62, wherein the plurality of optical scan modules and the photo detection
20 unit detecting the synchronism detection signal are integrally held on the identical circuit substrate.

65. An optical scanner in which an identical substrate

source and a deflector for deflecting a light beam from the light emission source to repeat a scanning and which are accommodated in an identical holder frame, wherein the deflector is disposed at a position spaced at a predetermined distance from a position where a loop of vibration occurs when the substrate vibrates.

66. The optical scanner according to claim 65, wherein the optical scan modules are arrayed on the identical substrate with an aligned light beam scan direction.

67. An optical scanner in which an identical substrate has arrayed thereon a plurality of optical scan modules constituted with optical systems which have a light emission source and a deflector for deflecting a light beam from the light emission source to repeat a scanning and which are accommodated in an identical holder frame, wherein the deflector is disposed at a position where a node of vibration occurs when the substrate vibrates, or in a vicinity of the node.

68. The optical scanner according to claim 67, wherein the optical scan modules are arrayed on the identical

69. An optical scanner in which an identical substrate has arrayed thereon a plurality of optical scan modules constituted with optical systems which have a light emission source and a deflector for deflecting a light beam from the light emission source to repeat a scanning and which are accommodated in an identical holder frame, wherein the optical scan modules are arrayed on the substrate asymmetrically to each other.

70. The optical scanner according to claim 69, wherein the optical scan modules are arrayed on the identical substrate with an aligned light beam scan direction.

71. An optical scan method, wherein, on a principal scan direction, a k-th optical scan module has a record width thereof corrected to perform an optical scan, by combination of a variation up to a scan finish end detection relative to a record finish end position by the k-th optical scan module and a variation up to a record start end position relative to a scan start end detection by a (k+1)-th optical scan module.

72. An image generator in which a latent image is formed

visible image to be transferred on a record medium to have a recorded image,

wherein the optical writing unit is an optical scanner comprising an optical scan module fixed on another member,

5 the optical scan module constituted as a single integral solid body with a function for deflecting a light beam from a light emission source by a deflection unit to repeat scanning,

wherein the optical scan module has an arrangement
10 in which the light emission source, the deflection unit, and terminals connected to a drive circuit for the light emission source or a drive circuit for the deflection unit are integrally fixed to a holder, the holder is formed with an abutment portion to be brought into abutment with another
15 member when mounted to the other member, and the terminals constitute a mounting unit for mounting the holder to the other member,

wherein k units of optical scan modules are arranged to be fixed on a circuit substrate which is constituted as
20 the other member and identical to that formed with the light emission source and the deflection unit.

73. An image generator in which a latent image is formed

visible image to be transferred on a record medium to have a recorded image,

wherein the optical writing unit is an optical scanner comprising an optical scan module fixed on another member,

5 the optical scan module including a light emission source and a deflection unit which deflects a light beam from the light emission source to repeat scanning,

wherein the optical scan module has a holder provided with electrodes for electrical wiring to the light emission
10 source and the deflection unit and configured for holding a movable portion of the deflection unit, and a sealing substrate to be provided together with the holder in a piled relationship, and the light emission source and the movable
15 portion of the deflection unit are enveloped to be tight-closed between the holder and the sealing substrate,

wherein k units of optical scan modules are arranged to be fixed on a circuit substrate which is constituted as the other member and identical to that formed with the light emission source and the deflection unit.

20

74. An image generator in which a latent image is formed by irradiation of light from an optical writing unit on a uniformly charged photo-sensitive body and changed to a

wherein the optical writing unit is an optical scanner comprising an optical scan module fixed on another member,

the optical scan module including a light emission source and a deflection unit which deflects a light beam
5 from the light emission source to repeat scanning,

wherein, on an electrode substrate for provision of electrodes connected to the light emission source and the deflection unit and a bearing of the deflection unit, a light source portion substrate applied with the light emission
10 source and a monitor unit which detects a light quantity of light beam from the light emission source and a deflection portion substrate for holding a movable portion of the deflection unit are piled and sealed with a sealing substrate, whereby the light emission source and the movable portion
15 of the deflection unit are enveloped and tight-closed,

wherein k units of optical scan modules are arranged to be fixed on a circuit substrate which is constituted as the other member and identical to that formed with the light emission source and the deflection unit.

20

75. An image reader comprising a placement unit for placing a readable text thereon, a scan unit which scans the text on the place unit, and a read unit which reads light projected

wherein the optical writing unit is an optical scanner comprising an optical scan module fixed on another member,

the optical scan module constituted as a single integral solid body with a function for deflecting a light beam from a light emission source by a deflection unit to repeat scanning,

wherein the optical scan module has an arrangement in which the light emission source, the deflection unit, and terminals connected to a drive circuit for the light emission source or a drive circuit for the deflection unit are integrally fixed to a holder, the holder is formed with an abutment portion to be brought into abutment with another member when mounted to the other member, and the terminals constitute a mounting unit for mounting the holder to the other member,

wherein k units of optical scan modules are arranged to be fixed on a circuit substrate which is constituted as the other member and identical to that formed with the light emission source and the deflection unit.

76. An image reader comprising a placement unit for placing a readable text thereon, a scan unit which scans the text on the place unit, and a read unit which reads light projected

wherein the optical writing unit is an optical scanner comprising an optical scan module fixed on another member,

the optical scan module including a light emission source and a deflection unit which deflects a light beam
5 from the light emission source to repeat scanning,

wherein the optical scan module has a holder provided with electrodes for electrical wiring to the light emission source and the deflection unit and configured for holding a movable portion of the deflection unit, and a sealing
10 substrate to be provided together with the holder in a piled relationship, and the light emission source and the movable portion of the deflection unit are enveloped to be tight-closed between the holder and the sealing substrate,

wherein k units of optical scan modules are arranged
15 to be fixed on a circuit substrate which is constituted as the other member and identical to that formed with the light emission source and the deflection unit.

77. An image reader comprising a placement unit for placing
20 a readable text thereon, a scan unit which scans the text on the place unit, and a read unit which reads light projected from the scan unit and reflected on the text on the place unit,

the optical scan module including a light emission source and a deflection unit which deflects a light beam from the light emission source to repeat scanning,

5 wherein, on an electrode substrate for provision of electrodes connected to the light emission source and the deflection unit and a bearing of the deflection unit, a light source portion substrate applied with the light emission source and a monitor unit which detects a light quantity of light beam from the light emission source and a deflection
10 portion substrate for holding a movable portion of the deflection unit are piled and sealed with a sealing substrate, whereby the light emission source and the movable portion of the deflection unit are enveloped and tight-closed,

wherein k units of optical scan modules are arranged
15 to be fixed on a circuit substrate which is constituted as the other member and identical to that formed with the light emission source and the deflection unit.